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## Scholarly insight Winter 2019: a Data wrangler perspective

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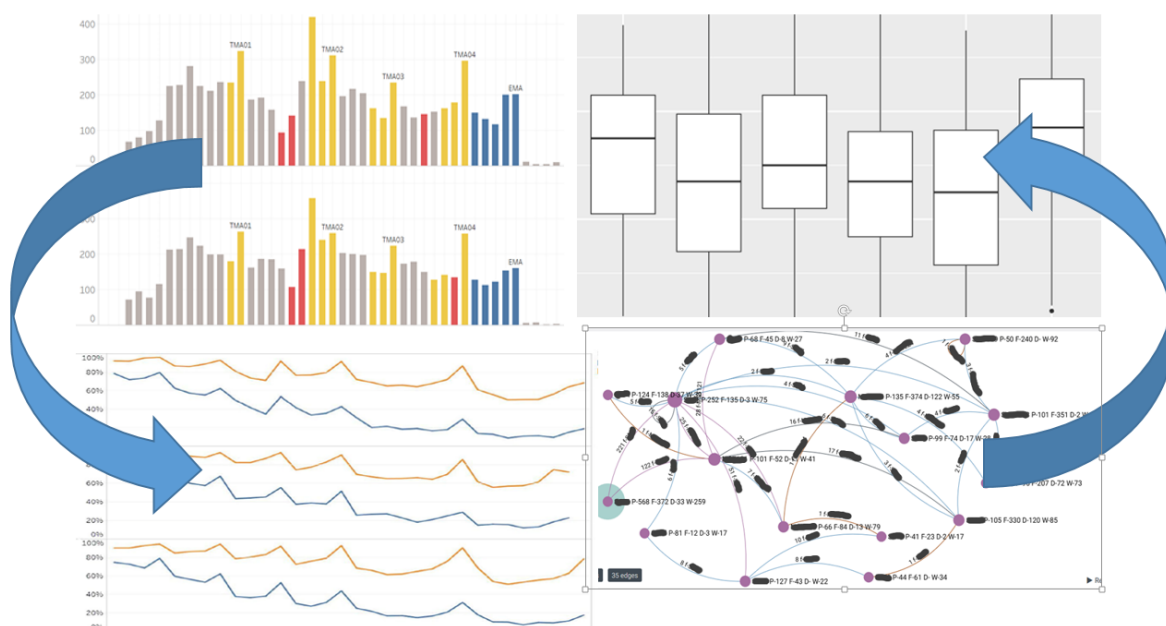
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## Scholarly insight Winter 2019: a Data wrangler perspective

**Doug Clow, Tim Coughlan, Simon Cross, Chris Edwards, Mark Gaved, Christothea Herodotou, Quan Nguyen, Bart Rienties, Sam Thorne, Thomas Ullmann**



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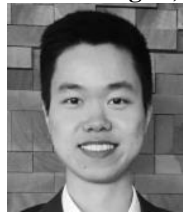
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## FOREWORD

Henry Ford famously said that “Any customer can have a car painted any colour that he wants so long as it is black.” Similarly, our Prime Minister Theresa May indicated in 2016 to aim for a “red, white and blue Brexit”. While the Open University (OU) has been open for 50 years to all learners, we are aware that our students have unique and different learning needs, experiences, and expertise. The OU recognises that we need to carefully listen to our students, and focus on their needs. Nonetheless, in some of our narratives we tend to simplify and generalise these multiple, complex student voices into one common voice. As highlighted in all three chapters in this fifth Scholarly Insight report, working intensively together with the Faculties our Data wranglers have found strong empirical evidence that our students indeed have very unique and distinct voices, which influence their engagement, behaviour, and study success.

In [Chapter 1](#) we worked closely together with the four Faculties to further unpack the qualitative feedback and students’ comments of the Student experience on a module (SEAM) survey (e.g., do Open degree students have different narratives when providing feedback; do high performing students “talk” differently from low performing students). Indeed our text analytics toolkit has highlighted that Open degree students speak differently from others (e.g., needing enough study time). Furthermore, higher achieving students report on different topics (e.g., content, feedback, group) than lower achievers (e.g., help, problem, experience). The OU needs to carefully balance these different voices, as addressing one concern from a high achieving student might not necessarily benefit other students, and vice-versa.

In [Chapter 2](#) describes three approaches of students selecting different module pathways towards qualification completion. For one Open Degree programme in Creative Writing we find that 268 unique paths are taken by students, whereby some paths are more successful than others. Follow-up analyses in QUAL2F3 indicate substantial differences in pass rates and success depending on the respective route, specialism, and pathways students are taking. Sign-posting these “successful” paths to OU staff and students may help students to make more informed decisions of what to study next.

Finally in [Chapter 3](#) we explore how students make timing decisions when to study for a module, and how so-called study break and assessment preparation weeks could help to provide more flexibility for our students. Study breaks are weeks during which no learning activities are planned or take place, and students are not expected to study for a module. Our big data analyses with 123,916 students and 205 OU modules indicate that the way OU designs study weeks has a substantial impact in how students study over time. Study break weeks substantially increase the chances of students to pass a module, while assessment preparation weeks are not related to pass rates

We hope that our Scholarly insights can help to inform our staff, but also spark some ideas how to further improve our understanding of the different student voices and qualification pathways.

Doug Clow, Tim Coughlan, Simon Cross, Chris Edwards, Mark Gaved, Christothea Herodotou, Quan Nguyen,  
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# EXECUTIVE SUMMARY

## **1. A big data analysis of SEaM comments: What are students saying about your Faculty?**

Building on our previous Scholarly Insight report ([Ullmann et al., 2018](#)), in [Chapter 1](#) five follow-up case studies were conducted using a new technique to automatically interrogate open text Student Evaluation on a Module (SEaM) comments for relative use of key words and sentiment. One case study was conducted in each Faculty and one in relation to the cross-Faculty Open Programme. Case studies were specified and agreed through consultations with each Faculty and with LTI. The approach used in this study could help avoid favouring certain types of comment and inadvertently giving preference to the views of one student group over another. The approach used here could help tease out what these differences may be weaker students tend not to articulate problems as well. Each key finding (KF) is briefly described in this section.

### **KF1. Qualification and study programme influence quality and articulation of SEaM comments**

- The *FACULTY 3* and *Open Programme* case studies indicate that students studying towards a qualification comment on different matters than students studying the same modules but towards another qualification.
- Furthermore, the *FACULTY 3* case study indicates that one student group may use more specific language or a fuller vocabulary to highlight issues important to their student experience than another.
- This could mean we tend to ‘listen’ to and action the (more effective) articulations of some students that are associated with the issues or problems they face to the detriment of others.

Recommendation 1: At the module and qualification level, when reading and responding to SEaM comments it is important to be aware that there may be differences between the quality and nature of comments between students studying the same modules but towards different qualifications.

### **KF2. Higher and lower achieving students have different student voices**

The *FACULTY 4* case study showed that higher achieving students have different issues than low performing students.

- Higher achieving students reported a series of topics that are important for their study such as content, feedback, group, and interaction.
- Lower achievers reported more often that they had issues and used terms associated with individual experience and receiving guidance.

Recommendation 2: Comments from both higher and lower achieving groups must be taken into account. Scholarly work that makes use of SEaM data should stay alert to differences within cohorts thereby ensuring analysis does not conflate or inaccurately summarise distinct views.

### **KF3. Open Degree Students have “different” learning experience and indicate this differently in SEAM**

Open Degree students spoke more frequently about needing enough study time (such as between final TMA and EMAs) and showed more positive sentiment towards activities such as reading, research, and forums.

Recommendation 3: Qualification and modules should be aware that Open Programme students and students not located in the 'home' discipline of the module may have significantly different views of the module than those students studying the ('home') qualification. Appropriate steps in design, delivery and evaluation of modules should be taken.

### **KF4. FACULTY 1 Students' experiences change over time**

The *FACULTY 1* case study helped begin to show how the sentiment in which specific employability topics are described in SEaM comments may change over time.

Recommendation 4: The automated sentiment analysis can help to make changes in sentiment and learner perception of modules more visible.

### **KF5. Substantial differences in SEAM responses between Faculties**

- There was no single core group of keywords that surfaced across the five case studies, although each case study defined the two comparison groups in different ways (e.g., high and low achievers, Level 3 vs Level 1 and 2).
- Differences may potentially be associated with group definition or could reflect Faculty or qualification specific issues. The reasons for this variation in keywords needs further investigation.

Recommendation 5: For a feedback process to work effectively, all respondents should have access to a vocabulary and a means to convey what they liked and did not like. It would appear that some student groups may need further support in gaining the skills to fully articulate the issues they encounter, or that additional methods of eliciting student qualitative student feedback are required in parallel with the survey.

- The technique used for the analysis has proved itself capable of identifying key words that are statistically more likely to be used by one group than another and as a first step in the analysis of sentiment.
- The findings outlined above give examples of how this could be applied to the analysis of modules and qualifications such as identifying trends or issues across large data sets.

Recommendation 6: Use the feedback from Faculties received during this investigation to outline a plan for developing this for wider use by OU staff. This may help to give staff more confidence in the feedback they action and avoid potential bias.

## **2. Understanding the pathways students take through qualifications, and the impact of their choices on their success**

The OU's shift of focus to qualification as the context for analysis has meant it is important for Faculties to gain an improved understanding of the implications of the study paths students take. Building on our initial work ([Rienties, Clow, et al., 2017](#); [Ullmann et al., 2018](#)), [Chapter 2](#) describes three approaches that have been developed to enable the relative volumes and success rates of students selecting different module pathways towards qualification completion. [Chapter 2](#) reports on pathway progression on two module pathways: the [Open Degree in Part A](#), and [QUAL2F3: QUAL2F3 in Part B](#). For the Open Degree, we have looked at the different module selections taken by students that qualify as participating in Stage 1 of the Open Degree 'Creative Writing' recommended study route. For the QUAL2F3 degree, we have made two explorations: the first, of the performance of students aligning with one of six specialist routes and the second of those taking the most common module selections through the degree. Each of the three approaches uses the same dataset which includes all Access and undergraduate study from 2012H to 2018V. This comprised around 1.2 million study attempts (including resits and resubmissions) and 400k unique students.

### **KF7 Substantial differences in pass rates depending on qualification sequence**

- For the Open Programme Stage 1 'Creative Writing' programme of study, 268 different paths have actually been taken by students.
- The most popular Stage 1 study combination is: M1F1 -> M2F1: 73% of students who pass M1F1, also pass M2F1 as their next module at their first attempt.
- The most effective study path starts with an Access module entry: M1F0 -> M1F1 -> M2F1. This enables 77% of students who attempt the final module to pass first time.
- The least effective combination of modules for enabling students to pass their final module is M1F3 -> M1F1 with a rate of success at first attempt at the last module of 67%. This means that for the most popular study routes (with over 100 students) there is a significant difference of 10% in terms of enabling students to pass their final module at first attempt.

Recommendation 7: The most popular combination of modules studied at Stage 1 that are aligned with the Creative Writing study route are relatively effective in enabling students to succeed at first attempt and it is appropriate to recommend them. Those taking the Access module M1F0, before moving onto their undergraduate study are on average more likely to pass their Stage 1 study. Therefore, this should continue to be recommended for the groups Access modules are designed for.

### **KF 8: Qualifications become “fragmented” relatively quickly over time**

The analysis leading to the visualisation of the study routes taken by new students passing the specific (2012J) presentation of M2F3 highlights just how fragmented a cohort very rapidly becomes. This also has more general implications for how we consider study cohorts on module presentations i.e., on many modules students will be joining from a multiplicity of study routes. The visualisation itself can inform discussion of major study paths.



Recommendation 8: Gaining an understanding of the subsequent student study paths of a new cohort of students and their relative rates of success helps provide an insight into the overall study experience as well as assist in curriculum development decisions. The process of developing a visualisation, as well as the visualisation itself, make a considerable contribution to this understanding and is recommended for Key Introductory modules.

### **3. Impact of study breaks on intertemporal engagement and pass rate**

Building on a recent large-scale big data study of 123,916 students ([Nguyen, Thorne, & Rienties, 2018](#)), study breaks and exam revision weeks are increasingly embedded in learning design of blended and online modules at the OU under the assumption that students would make use of this time to catch up with their study or prepare for upcoming assessment tasks. In [Chapter 3](#) our analyses indicated that primarily study breaks and not exam revision weeks had a positive effect on engagement and pass rates. One argument for this positive effect of study breaks was that it allowed students to catch-up, and/or give students a bit of a breather to do other things. Our more fine-grained analyses with five modules across the Faculties illustrate substantial variation in practice how learning design is implemented, and study breaks and exam revision weeks. Our findings strongly support that we need to give our students sufficient time to take a breather in the module, rather than cramping everything into 30 consecutive weeks of learning and teaching.

#### **KF 9: Study break weeks increase the chances of students to pass a module**

Recommendation 9: OU modules should include in their design study break weeks where no learning activities take place and students are not expected to study. These could coincide with cultural festivities such as Christmas and Easter.

#### **KF 10: Students are particularly active during the TMA and EMA preparation weeks, yet this engagement is not related to the module pass rates.**

Recommendation 10: Although TMA and EMA preparation weeks were not related to the chances of passing a module, they may be beneficial for students in terms of preparing and submitting their next assignment. Their active engagement with VLE the weeks before the TMA and EMA submission deadlines may suggest that these weeks are viewed by students as an opportunity to study, complete and submit their assignment.

Note that in this public version we have anonymised all names and codes of OU modules and qualifications. For OU staff who have access to Intranet, you can download the full results at <http://intranet6.open.ac.uk/learning-teaching-innovation/main/data-wrangling>

# 1 A BIG DATA ANALYSIS OF SEAM COMMENTS: WHAT ARE STUDENTS SAYING ABOUT YOUR FACULTY?

## Highlights

1. Machine learning approaches analysing Student Evaluation on a Module (SEaM) comments indicate substantial differences in how FACULTY 3 and Open degree students comment on a module depending on their respective qualification
2. Open degree students indicate a need for more study time
3. High performing FACULTY 4 students differ significantly in their comments from low performing students, and raise different “issues” and “problems”
4. Sentiment analyses indicated that FACULTY 1 students changed their employability perceptions over time
5. Need to follow-up “big data and small data” approaches to unpack different student voices

## 1.1 Introduction

The OU’s Student Experience on a Module (SEaM) survey captures millions of words of student feedback. Conventionally, the only option has been manual analysis of student answers to the open-ended questions asked in SEaM. As part of the quality enhancement strategy, each module chair and often other team members read and analyse this feedback in order to gain insight into student perspectives and guide revisions to the module. This process of the manual analysis of the student comments, however, becomes intractable with growing student responses ([Richardson, 2005](#)), as the manual analysis is time-consuming and resource-intensive. This study explores how an automated technique could help support this process.

The previous Scholarly Insight Report ([Ullmann et al., 2018](#)) and other OU research ([Charitonos et al., 2018](#); [Coughlan, Ullmann, & Lister, 2017](#); [Ullmann, 2015b, 2015c, 2015d, 2017](#)) argued for the use of automated methods in order to make sense of unstructured textual data. These are techniques that work at scale and are rapid. They are similar to the most common tasks of the manual content analysis, which are the exploration of data (often in the beginning with the absence of a coding framework), the annotation of texts according to a framework, and conducting statistical tests based on the annotations.

There are many automated methods that are similar to each manual content analysis task (Table 1.1 lists some of them). The key word analysis approach used in here ([Charitonos et al., 2018](#); [Coughlan et al., 2017](#); [Ullmann, 2015b, 2015c, 2015d, 2017](#)) finds words/themes that students talk about unusually often ([Rayson, 2008](#)). These words are of interest as we would wonder why students talk about them that often. The dictionary-based approach ([Ullmann, 2015a](#)) uses a list of words that are closely associated with a theme. If the text contains a dictionary word then it is annotated with the category label, mimicking the manual annotation task. Sentiment analysis ([Rienties & Alden Rivers, 2014](#)) (often implemented as a dictionary-based approach) is again a technique that annotates text according to categories, in the simplest case the category classes of a sentiment framework are positive and negative. Once

the text is annotated, the frequency counts for each category can be used as input for statistical tests, such as the  $X^2$ -test ([Charitonos et al., 2018](#); [Ullmann et al., 2018](#)).

*Table 1.1 Manual and automated text analysis techniques*

<i>Manual content analysis</i>	<i>Text Analysis used in here</i>
Exploring themes	Keyword analysis
Annotate text according to a framework	Dictionary-based approach Sentiment analysis
Statistical analysis based on manually annotated data	Statistical analysis based on automatically annotated data

Due to the effort of the manual content analysis, the Data Wranglers ([Rienties, Cross, Marsh, & Ullmann, 2017](#)) had to carefully consider the extend of any manual content analysis requested by the Faculties due to the time-consuming character. For this report, the Data Wranglers were able to encourage the Faculties to consider large scale exploration of student comments. As indicated in section 1.2, a consultative approach was developed with the Faculties to construct the following research questions:

RQ1. What are the differences between students with an M&S qualification aim versus students studying the same modules but working towards a different qualification aim with regards to the SEaM free-text responses of the students?

RQ2. What are the differences between students studying towards an Open degree versus students studying towards a named qualification with regards to the SEaM free-text responses of the students?

RQ3. What are the differences between high and low performing students with regards to the SEaM free-text responses of the students?

RQ4. What are the differences between level 1 and 2 and level 3 students with regards to the SEaM free-text responses of the students about collaborative activities?

RQ5. How positive are students' comments about employability?

## 1.2 Method and approaches used

Consultation with Faculty-nominated representatives took place between September and November 2018<sup>1</sup>. There was at least one representative from each of the four Faculties and one from the Open Programme. Each representative was invited to identify, in consultation with

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<sup>1</sup> FASS: Stefanie Sinclair, Tina Forbes, Volker Patent, Sarah Smith, Gary Kitchen, Anna Plassart; FBL: Sam Thorne, Keith Honnor; LTI: Peter Taylor, Helen Cooke; STEM: Tim Lowe, Gaynor Arrowsmith; and WELS: Rebecca Jones.

relevant others in the Faculty, and discuss with the project team the issue(s) that they would be most interested in using the approach to learn more about. This was to ensure that the technique does not steer the problem description. Representatives were asked that the Faculty considers the analysis of open-ended questions beyond the module level, such as the programme level, undergraduate level, combinations of modules, or specific student groups across modules. Following each Faculty's description of their requirements, the Data Wrangler outlined how automated methods can be used to address the raised issues.

The initial consultation outlined above set the terms and scope of our analysis of SEaM open comments for each Faculty. In practice, the requirement analysis led to a list of potential topics for each Faculty which were then prioritised. Due to the defined time-span for the DW reports, it was agreed that the first topic of each Faculty will be given priority for this Scholarly Insight report. The requirement analysis also showed that requirements of the Faculties are multi-fold and that there is a range of important topics that the DWs could work on over time. The priority Faculty topics identified for investigation in this report are:

**FACULTY 3:** Department X is interested in potential differences between students with an DEPARTMENT X qualification aim (i.e., QUAL1F3) when studying M&S modules, and students studying the same modules but working towards a different qualification aim.

**Open Programme:** The BA/BSc (Hons) Open degree is the largest qualification awarded by the OU - offering students more choice of modules and study order, yet also presenting students with some additional challenges. In this context, the Open Programme team was interested in differences in the study experience of the most recent presentations between Open degree students and those studying a named qualification.

**FACULTY 4** were interested in the differences regarding the student experience of high and low performing students. Their focus was a better understanding of what issues are raised by these group of students. The selected case study was modules comprising the qualifications QUAL1F4.

**FACULTY 2** were interested in the differences between students in level 1 and 2 modules (which tend to have a more assimilative learning design) and level 3 module (which have many more collaborative elements and one module where students can experience pro bono legal work) in the QUAL1F2 and QUAL1F3 qualifications. They expressed special interest in insights relating to collaborative activities on level 3 (e.g., potential design tweaks) and whether the comment data could provide a steer in respect to including more collaborative work into level 1 and 2 modules.

**FACULTY 1:** Recognising that employability is currently considered to be of strategic importance (i.e., following the 2016 HEA review of employability at the OU), the Faculty was interested to learn more about what students were saying about employability. This insight could help inform ongoing work in the Faculty such as the Enhanced Employability and Career Progression. Unlike other Faculties, no specific qualification was identified, but a range of modules that are actively engaged in scholarly projects about employability.

The suggestions given by the Faculties above resulted in five case-studies for piloting the technique of automated analysis of key words in open comment SEaM data. The method used is broadly similar to that reported in the previous Data Wrangler report ([Ullmann et al., 2018](#)).

### 1.3 Findings

This section presents the headline findings for each case study. The details for each study can be found in the [Appendix 1](#) (Only accessible for OU Staff).

#### 1.3.1. FACULTY 3 DEPARTMENT X Qualification

The Department X Board of Studies has responsibility for a range of undergraduate modules which attract students from not just mathematics and statistics but from other qualifications as well. Therefore, learners may have different prior learning experiences and may bring different expectations to these modules. We will refer to the latter one as to the reference qualifications.

In terms of RQ1 (What are the differences between students with an DEPARTMENT X qualification aim versus students studying the same modules but working towards a different qualification aim with regards to the SEaM free-text responses of the students?), the following findings are the results of the key word analysis method, which finds words that are mentioned unusually or significantly more often (or unusually sporadically) by one group over the other group. The interpretation of each key words is based on a manual analysis of a random sample of sentences that has the keyword.

The analysis included open comments from 22 DEPARTMENT X modules ([see Table A1.1](#)).

Comments from these modules were collected together and analysed. The analysis revealed 12 top key words ([see Table A1.2](#)). Terms (this refers to nouns and multi-nouns) of interest used much more frequently by DEPARTMENT X students are: 'unit', 'answer' and 'revision.' The second and third column report frequencies and the fourth the log-likelihood ratio (LL-ratio). The greater the LL-ratio, the greater the difference in word use between the two groups.

More frequent mention of 'unit' may mean that DEPARTMENT X students think more at the level of individual units of courses. Inspection of the open comments shows that they mostly use 'unit' in the context of the perceived quality of specific units in a module or to a lesser degree to how units should ideally interlink. Compared to the reference qualification DEPARTMENT X students provide significantly more feedback specific to individual units. Non-DEPARTMENT X students seem to prefer more generic terms (than 'unit') when talking about their learning choosing words such as 'course' or 'module' and express remarks about the observed quality of the whole course. This may indicate that DEPARTMENT X students are more specific in their feedback and thereby, potentially, provide more 'actionable' feedback to the module team than their non-DEPARTMENT X counterparts. According to the Faculty, the term 'unit' is only used in level 1 modules to describe the individual topics/chapters that make up the module. The inspection of a random sample of student comments revealed that the term is used on all three levels indicating that students keep on using this term beyond level 1.

DEPARTMENT X students make comparatively more mention of the term 'answer', which on closer inspection most often refers to the 'model' answer provided by the module and/or the answer given by the student (i.e., about how an answer of a student compared with marked answers). The model answers are very important for students as they can compare their answer to a prototypical best answer provided by the teachers. The fact that DEPARTMENT X students talk more about these 'answers', may indicate that these answers are more important to them than the non-DEPARTMENT X qualification students.

Similarly, DEPARTMENT X students talk about 'revision' more often than those students studying DEPARTMENT X modules towards another qualification. 'Revision' is mostly used in relation to student's engagement with revisions for exam preparations and less often used in relation to module revisions. It may be the case that for DEPARTMENT X students revisions are particularly important and this may be the reason as to why they comment on them more frequently. Other OU studies have sought to foreground the role of revision ([Cross, Whitelock, & Mittelmeier, 2015](#)), see also [Chapter 3](#), so it is interesting to see this theme emerging in this analysis as well. According to the Faculty, revisions are important to encourage students to develop fluency in the methods and techniques that will be needed in subsequent modules. Students are expected to learn not only for the sake of an exam, but also to build long lasting skills. They can also help students develop links between different topics in the module.

Conversely, what are the topics that DEPARTMENT X students talk less about? Or put another way, in DEPARTMENT X led qualifications, what topics do non-DEPARTMENT X qualification students talk about more. The underused word 'concept' refers mostly to difficulty a student had with a concept although in some cases it is used to express praise for how well the module writers explain a concept. The term 'knowledge' was mostly used by students to express some form of knowledge gain. The comparative underuse of both terms by DEPARTMENT X qualification students may indicate they have fewer problems with learning concepts and knowledge; perhaps as they may be already more familiar with the concepts, they have better strategies to learn, or have greater prior knowledge to support their learning. The use of the term 'issue' refers mostly to issues with the course. DEPARTMENT X students mentioned 'issues' less frequently which may indicate they have less issues with the module.

The word 'feedback' is used in the context of either tutor feedback or written TMA feedback. Given the results reported earlier concerning the words 'answers' and 'revision', it was expected that DEPARTMENT X qualification students would also use the term 'feedback' more often. However, this was not the case. The term is significantly less often used by DEPARTMENT X students. There are several possible interpretations for this. It may be that DEPARTMENT X students are tending to use more specific words to talk about feedback (feedback can be seen as an umbrella term for all sorts of feedback, such as TMA and EMA feedback, tutor feedback, peer feedback, etc.) whilst non-DEPARTMENT X qualification students use the more generic catch-all term 'feedback'. This could also explain why DEPARTMENT X qualification students use the more precise word 'unit' more often but non-DEPARTMENT X qualification students use the more general higher-level terms 'course' and 'module'. A second explanation could be that the feedback provided met the expectations of the DEPARTMENT X students better and, therefore, was mentioned less.



### 1.3.2. Open Programme

The BA/BSc (Hons) Open degree offers learners a unique choice of study that can range across disciplines. In terms of RQ2, we are primarily interested in the following questions: How do the SEaM open comments of this group of multidisciplinary students differ from the comments of students studying a subject-specific named degree? Have any particular issues been highlighted? The following findings are the results of the key word analysis method (see above), which finds words that are mentioned unusually or significantly more often (or unusually sporadically) by one group over the other group. The interpretation of each key words is based on a manual analysis of a random sample of sentences that has the keyword.

*Table 1.2 OPEN1: Log-likelihood ratio of student comments*

Term	Actual	Reference	LL-ratio	Use
Course	954	2859	70.27	+
M1F1	8	135	22.96	-
M2F1	4	89	18.64	-
research	79	196	13.59	+
Ema	381	1269	13.22	+
prison	22	32	12.86	+
reading	167	499	12.51	+
week	237	1249	12.33	-
thinking	31	57	11.94	+
pdf	22	34	11.68	+
day school	25	201	11.65	-
topic	211	1114	11.15	-
tma05	45	101	10.65	+
level	289	957	10.55	+
exam	282	1431	10.29	-
forum	313	1049	10.27	+
course material	146	441	10.27	+
module content	14	129	10.03	-

As indicated in Table 1.2, Open degree students mentioned the 'course' significantly more often compared to the students studying towards a named degree. Furthermore, students studying towards an Open degree are 1.18 times more likely to positively mention the course compared to named degree students ( $X^2(1) = 4.4$ ,  $p < .04$ , odds ratio = 1.18). This finding indicates that they more often want to make a statement about their general perception of the course and that they generally feel their study experience is more positive.

'Assessment' is another important topic mentioned more often by Open degree students than named degree students. Open degree students use 'EMA' and 'TMA05' unusually (i.e., a significant log-likelihood ratio as indicated by the key word method) often. When they talked about the EMA, they mostly emphasised not having enough time between the submission of the last TMA and the EMA. This is in line with the frequent use of the word 'TMA05' to challenge how close the TMA05 is to the final EMA. The need for the OU to ensure sufficient space between final TMA assessment and EMAs has been noted before ([Cross et al., 2015](#)). The Faculty contact pointed to another potential reason, which is that the Open Programme has a larger amount of students with disability. Whilst Open degree students wrote about the EMA and TMA05 unusually often, they underused the word 'exam'. There are several plausible reasons for this. All of them would need further investigation. A reason can be that Open students take fewer examinations, or that compared to a qualification where some mandatory modules may be examined, Open students have more choice as to which examined module they will study.

Open degree students also used the term 'research' more compared to named degree students. Inspection of the SEaM comments for differences in use was inconclusive: both groups use the word 'research' to either point out the experience they had with research, or when discussing their own (independent) research into a topic to better understand course material. It may be the case that the topic 'research' is more important for Open degree students than students on named qualifications. As Open degree students may choose modules of most interest to them, an elevated interest in the issue of research would be plausible and is an area for further investigation.

Open degree students make greater mention of terms associated with module materials such as: reading, forum, course material, module content, and topic. 'Reading' is used mostly to highlight that there was a lot to read for the time available and further analysis shows Open degree students are 1.37 times more positive about their reading experience than named degree students ( $X^2(1) = 4.6$ ,  $p < .04$ , odds ratio = 1.37). Open degree students also tend to overuse the word 'forum' - mostly to discuss the usefulness of forums - and sentences including this term are more positive than for named degree students ( $X^2(1) = 3.8$ ,  $p = .05$ , odds ratio = 1.31). The Faculty contact pointed out that Open degree students have in addition to the module forums access to qualification forums and there are also the OUSA (Open University Student Association) forums. Further analysis in the Appendix (Only accessible for OU Staff) examines the use of the terms 'course material' and 'topics.' Overall, it seems that issues related to module material are very important to Open degree students. This may be that with the choice of studying a particular module combination comes a critical attitude towards the module materials as their major source of knowledge.

Open degree students also tend to make greater mention of their thinking skills and the term 'level' (used to refer to both the appropriateness of study material for a certain study



level and to discuss the 'level' of support). Open degree students are 1.58 times more positive about sentences with the word 'level' compared to named degree students ( $X^2(1) = 10.7$ ,  $p \leq .001$ , odds ratio = 1.58). This frequent emphasis of the word 'level' may indicate that Open degree students are conscious about it is expected at a given level. Their more positive attitude towards levels may indicate that they are more happy about the design of the OU modules for each level and/or the level of support from the OU.

### 1.3.3. FACULTY 4: Key words of high and low performing students

As indicated by RQ3, a comparison between high and low performing students was the focus of the FACULTY 4 analysis. For this investigation a large set of modules were included in the sample (see [Appendix 1 for details](#)). High performing students are defined as students with distinction and grade 2 pass, and low performing students as students with the status fail-no resit, postponed, fail-resubmit certificate, and fail resit.

Inspection of the top key words (see [Table A1.3 in Appendix 1](#)) shows that high performing students mention the terms 'content', 'feedback', 'link', 'group', 'change', and 'interaction' unusually often when compared with low performing students. High performing students used the word 'content' mostly to refer to the perceived quality of the module content. High performing students were found to be very critical when it comes to broken content. This can be seen from how they talk about the term 'link'. Students use the word 'link' mostly in the context of complaining about broken hyperlinks. They also use it to a lesser degree to highlight certain connections or links that they have made while studying, such as a link between theory and practice, links between topics of the course, links to previous learning, etc. Broken links, the need of content updating, and awareness of changes in health and social care and the degree, are all issues that high performing students tend to mention more often compared to the low performing students.

The feedback that students receive is important for their academic progress. Inspection of SEaM comments shows that students use the word 'feedback' mostly to refer to the feedback they receive from their tutor but also to the written feedback to their marked assignments. As feedback is important for students in order to understand how they perform compared to the expectations set by the University, it seems plausible that this is an important topic mainly for high performing students as they are those commenting on it more often.

High performing students also debate more often about the ways of working with other students using words such as 'group', or 'interaction'. The word 'group' is often used in the context of group work. They use it to refer to their experiences of group work, to talk about tutor groups (online and face-to-face), or collaborative exercises. The term 'interaction' was mostly used to describe interaction with groups, in particular social interaction, face-to-face interaction and online interaction. Students use both words mainly to highlight problems. It seems that high performing students are sensitive to problems related to group work, which can be seen in the frequent comments that they made compared to the low performing students. Other explanations are possible as well. According to the Faculty, collaborative activities are often not essential and not part of the assessment. Possibly, stronger students will attempt these activities and therefore may have more of a say about them compared to weaker students that focus more on the materials that are essential for the course and therefore do not attempt those

additional activities. The issues of collaborative learning are also considered in the FACULTY 2 case study later in this chapter.

The terms 'Help', 'problems' and 'guide' were less often used by high performing students. Students use the word 'help' mostly to refer to the help that students received from the University, such as help from tutors, learning materials, and study guides. but also addressing the lack of help. The word 'problem' is used to note down various problems of students, such as problems with the module, but also problems with study skills. The term 'guide' mostly refers to the perception students had with the learning guides. High performing students may have less need for help and guidance and that is why they use the terms less often.

High performing students also talked less about their general experience. 'Experience' often refers to the learning experience of the students and the experience with the course, but also to mention their personal experience while studying. According to the Faculty, there may be a tendency for weaker students to focus too much on personal experience, and the experiences of individuals mentioned in the case studies of the module materials, and not enough on the theories and concepts that are supposed to illuminate their experiences. Further research would be necessary to unpick this further.

High performing students used less often the word 'none'. This may seem a strange observation, however, 'none' is often used to indicate that a student had nothing to comment on. This is a term that low performing students used more frequently/unusually often. Perhaps this indicates that low performing students feel they have less time to comment or do not see the value in commenting on their study experience. Use of the term 'none' would appear to go counter to an expectation that low performing students should have more to comment on. A reason for this contradiction is that low performing students may not have the skills to verbalise their study experience and this may have resulted instead in a short answer.

#### 1.3.4. FACULTY 2: Level differences in perceptions of Collaborative Learning

In terms of RQ4, the qualification is looking to understand more about the use of collaborative activities in Level 3 modules and for insight to steer the introduction of communicative activities and collaborative work in Levels 1 and 2. Analysis of key words showed that learners often provide sufficient detail in their comments to determine the type of peer-to-peer activity they are referring to, e.g., face-to-face or online, group tuition or forums, collaborative interaction whilst working on a learning activity or whilst attending a tutorial. Whilst 'collaborative' is a useful catch-up term it can tend to conflate what is a much more nuanced range of peer interaction.

In the following analysis, these keywords together with a list of collaborative activity words has been used to retrieve sentences about collaborative activities. Students can express a positive or negative stance towards collaborative activity. In here, we used a sentiment analysis tool to automatically determine their stance. With respect to modules, the degree to which students are positive about collaborative activity (in this case using words from a dictionary of terms determined by the Faculty) falls from Level 1 to 2, and again from Level 2 to 3. Students are therefore least positive about collaborative activity at Level 3 ([Table A1.9 in Appendix 1](#)). Further investigation of this apparent trend is recommended.

Students are comparatively most positive about topics associated with ‘TGF’ (Tutor Group Forums) and ‘Face-to-face tutorials’ (+.40 and +.34 respectively). They are least positive in sentences that use terms such as ‘group work’ and (usually tutor group) ‘forum’ (+0.17 and +.13), although even the use of these terms across the levels is overall positive ([Table A.1.8 in Appendix 1](#)).

Most level 3 students who talk about 'face-to-face tutorials' noted a lack of it or difficulties in attending a face-to-face tutorial with some also highlighting benefits. This group of students use the term more frequently than Level 1 and 2 students. Students used the word 'group' mostly in the context of group work. Level 3 students noted several problems with the group work, such as group size, group differences (differences of group member availability, group effort, and competency differences). Overall, Level 3 students were more negative about group work compared to level 1 and 2 students (although the difference is not significant with  $X^2(1) = 0.78, p = .38$ ).

Analysis of aggregated sentiment (all terms in the Faculty defined dictionary of words) shows that Level 1 modules, Level 2 modules and M31F2 share similar sentiment scores ([see Appendix Table A1.7](#)). However, M32F2 and M33F2 have lower sentiment scores (W350 and W360 excluded as numbers of students too low). Inspection of the more recent student SEaM comments of M32F2 showed that whilst students commented on all sorts of collaborative activities, they most often talked about the collaborative TMA. Most students were more negative about it although some liked it. The critical voices mentioned issues, such as problems with collaboration and being dependent on others, logistics, group size, and workload. Such feedback may help tweak the activity in future presentations.

### 1.3.5. FACULTY 1 Employability

The Enhanced Employability and Career Progression vision (2018) outlines how the OU intends to help students build on their ‘life and work experience [to] realise their individual potential to achieve personal and career wellbeing’. This itself builds on a trajectory exemplified by the 2011 Student Employability Policy Statement which states ‘the University will clearly indicate how student employability can be enhanced through study across the range of curriculum’ and more recently in the OU’s Employability Hub. FACULTY 1 is presently working on several projects to raise student awareness of how modules contribute to employability.

The analysis for FACULTY 1 comprised a general analysis of four modules, and a more specific analysis of M1F1. The results of both analyses are in the appendix. Here we highlight findings from the specific analysis of M1F1. To help measure the impact of this work, SEaM respondents use of employability dictionary words and sentiment was investigated for post-2015 and pre-2015 presentations of three FACULTY 1 modules using a dictionary of terms constructed from key words proposed by FACULTY 1 Faculty members. Analysis shows no overall change in sentiment - how positively or negatively students talk about employability - in SEaM open comments from before 2015 (positive ratio of +.52) and after (positive ratio of +.50) the 2015 intervention (Table 1.3).

*Table 1.3: FACULTY 1 Positivity of employability dictionary over MIF1 presentations*

Dictionary	Presentation	Students	Negative comments	Positive comments	Positive Ratio
FACULTY 1-sourced Dictionary employability	2015B and before	1634	787	847	0.52
FACULTY 1-sourced Dictionary employability	2015J and later	1338	668	670	0.50

Dictionary word analysis presents a similar and mixed picture ([Table A1.14 in Appendix1](#)). Many dictionary words such as ‘confident’, ‘progress,’ ‘personal,’ show no substantial improvement (difference ratio before and after 2015 of .05, .05, and .01 respectively). The terms ‘career’ and ‘achievement’ show improvement (+0.13 and +0.24). According to the Faculty contact there has been a concerted effort around career related issues, such as the introduction of a career advisor, which may reflect this positive trend. Other terms such as ‘job’, ‘success’ and ‘future study’ show a decrease (-.09, -.09 and -.30).

As with the other investigations reported in this section, it is important to balance such findings with a consideration of what students are referring to when using these dictionary words. For example, the word ‘career’ may be used by a student to explain that career is *not* important to them rather than feeling the module negatively impacted their career. A more detailed examination of how students were using these terms is given in [Appendix 1](#).

## 1.4 Conclusions

Traditionally, the student comments from the SEaM survey have been manually analysed by OU staff. There are certain restrictions to this approach, which we sought to overcome with a set of automated methods that mimic largely the manual content analysis approach. This toolkit of automated methods has been used in the context of five case studies, each case study representing a specific analytics need of each of the four Faculties and the Open Programme. We can draw conclusions based on each case study, but also general conclusions regarding the use of the automated methods to analyse student comments.

In terms of RQ1 and RQ2, the results from the FACULTY 3 and Open Programme case study indicate that students studying towards a qualification comment on different matters than students studying the same modules but towards another qualification. According to the FACULTY 3 case study, it also seems that these students use more specific language to highlight issues important to their student experience. These students appear to have a more precise or fuller vocabulary for describing issues than others. This may mean they are better able to articulate and explain issues or problems in the module in ways that we find easier to action and resolve. It is important to be awareness that there are differences between students studying the same modules but towards different qualification. These groups describe different problems, which need addressing, and they may express their concerns on different levels of specificity, which may make it easier to address concerns of one group but may make it harder to address the concerns of the other group. When reading and responding to SEaM open comments module teams must be aware that differences between groups may occur and can

use this technique to ensure they are not inadvertently giving preference to the views of one group over another.

Open degree students spoke more frequently about needing enough study time (such as between final TMA and EMAs) and showed more positive sentiment towards activities such as reading, research, and forums. All qualification and modules should be aware that Open degree students and students not located in the 'home' discipline of the module may have significantly different views of the module than those students studying the ('home') qualification that the module was written for and take appropriate steps in design and delivery.

In terms of RQ3, the results from the FACULTY 4 study showed that higher achieving students have different issues than low performing students. Higher achieving students reported a series of topics that are important for their study such as content, feedback, group, and interaction. Lower achievers reported more often that they had issues and used terms associated with individual experience and receiving guidance. It is important to stress that both groups have different problems, and this may mean that they need different solutions. Improvements on the topics of the successful students may help weaker students. Important will be to tease out the real problems of weaker students, as it seems that their problem descriptions are less concrete. Furthermore, scholarly work that uses SEaM data should look for differences within cohorts so as to ensure qualitative analysis do not conflate or inaccurately summarise distinct views.

The FACULTY 2 case study largely confirmed the anecdotal evidence of the Faculty regarding collaborative activity (RQ4). The automated analysis of student comments with custom dictionaries together with level progression information can help to get another perspective and a fuller picture of the underlying problems. The FACULTY 1 case study showed how specific employability topics change their sentiment over time. The automated sentiment analysis can help to make these changes of perception over time more visible (RQ5).

The technique used for the analysis has proved itself capable of identifying key words that are statistically more likely to be used by one group than another and as a first step in the analysis of sentiment. Using feedback from Faculties and module teams explore how this technique could be developed for wider use by the OU. This could help Faculties, for example, to identify particular trends, issues across the large data sets that are difficult to understand through manual reading. It may help to support staff to use feedback in an informed and less bias way.

The conclusions regarding the automated methods are: All automated techniques worked at scale beyond the module level. For example, the Open Programme analysis looked at nearly 25,000 comments, the FACULTY 4 study compared the comments of thousands of high and low performing students, and the study of FACULTY 2 compared thousands of students on level 1 and 2 with students of level 3. For a detailed discussion on the limitations and affordances of our approach, we refer to [Appendix 1.6](#).

## 1.5 Contacts

Main authors and contacts for this study: [Thomas Ullmann](#) and Simon Cross.

## 2. UNDERSTANDING THE PATHWAYS STUDENTS TAKE THROUGH QUALIFICATIONS, AND THE IMPACT OF THEIR CHOICES ON THEIR SUCCESS

### Highlights

1. Pathway progression on the Open Degree and QUAL2F3 were compared from 2012H to 2018V, comprising around 1.2 million study attempts and 400k unique students.
2. For the Open Programme Stage 1 'Creative Writing' programme of study 268 different paths are taken by students.
3. Substantial differences in pass rates depending on qualification sequence
4. The most effective study path starts with an Access module entry: M1F0 -> M1F1 -> M2F1.
5. Follow-up analyses within Science indicate that qualifications become "fragmented" relatively quickly over time
6. Gaining an understanding of the subsequent student study paths of a new cohort of students and their relative rates of success helps provide an insight into the overall study experience as well as assist in curriculum development decisions.

### 2.1 Introduction

The OU's shift of focus to qualification as the context for analysis has meant it is important for Faculties to gain an improved understanding of the implications of the study paths students take. This topic describes three approaches that have been developed to enable the relative volumes and success rates of students selecting different module pathways towards qualification completion. This topic reports on pathway progression on two module pathways: the Open Degree in Part A, and QUAL2F3: in Part B. For the Open Degree, we have looked at the different module selections taken by students that qualify as participating in Stage 1 of the Open Degree 'Creative Writing' recommended study route. For the QUAL2F3 degree, we have made two explorations: the first, of the performance of students aligning with one of six specialist routes and the second of those taking the most common module selections through the degree.

Each of the three approaches uses the same dataset which includes all Access and undergraduate study from 2012H to 2018V. This comprised around 1.2 million study attempts (including resits and resubmissions) and 400k unique students. Unless otherwise stated, any results are the from queries run on this entire dataset. All the records are for students still registered at day 13 of a module: often referred to as the 25% fee liability point or R25. Throughout Topic 2 we have used the percentage of students passing a particular study path, compared with those achieving all outcomes, as an indicator of what might be best described as success at first attempt as it provides an indication of how well students cope with a particular path of study. It is therefore distinct from pass rate, which is used as an indicator for a particular module. Success at first attempt therefore, fits well with the context of student journeys to qualification, whereas pass rate fits well with a module view.



### 2.1.1. Open Degree

There are a number of suggested 'study routes' for the Open Degree in the online prospectus. These support 180 credits of study (60 credits at each stage) in a selected subject area. To help guide students in their choices, the Open programme has wide range of suggested [study routes](#). This report focuses on the Arts and Humanities Creative Writing study route. It was selected by the qualification director as a straightforward study route on which to begin this work. Given the number of potential study paths through modules, including those which start with an Access module, this report specifically explores student progression on different routes through Stage 1 as it is sufficient to illustrate the approach. The Creative writing study path consists of three modules:

Stage 1: M1F1

Stage 2: M21F1

Stage 3: M31F1

As this study route comprises 180 credits, students take these modules alongside a selection of other modules to achieve an Open degree (these may belong to one of the other recommended Open Programme study routes). If a student opted to study Creative writing (CW) they could study Stage 1 (currently M1F1) ('CW1') in one of the following five generic study paths:

Path a) **CW1** -> Level 1 30 credit -> Level 1 30 credit

Path b) Level 1 30 credit -> **CW1** -> Level 1 30 credit

Path c) Level 1 30 credit -> Level 1 30 credit -> **CW1**

Path d) **CW1** -> Level 1 60 credit

Path e) Level 1 60 credit -> **CW1**

In total, this produces a potential 125 (5<sup>3</sup>) generic study paths for an Open degree with Creative Writing. In fact, because there are so many potential 30 and 60 credit modules, the real number of actual study combinations is very much greater. Students may also begin their study with one of the three Access modules (M1F0, M2F0 and M3F0) and we will also consider these study choices for our Level 1 analysis. We ask two overall research questions:

RQ 6. How many students studied each of the five generic study paths through Creative Writing Stage 1 ('CW1')?

RQ 7. How successful are students in completing Stage 1 by each of these routes?

### 2.1.2. QUAL2F3

QUAL2F3 is a key qualification in Faculty 3. Within the qualification, students may choose to study modules broadly, or to align with one of six specialist routes. It has been a longstanding challenge for the Faculty to understand the performance of students on different routes within the qualification. Since 2016, the qualification has offered these different routes as specialisms that can be listed on the student's degree certificate, e.g., QUAL2F3 (specialisation 1).

This section applies two approaches to this context: the ArangoDB visualisation tool and an entirely different, new pathway approach. The ArangoDB tool provides an interactive visual illustration of the paths students take through a qualification. These paths are complex, which can make analysis and actionable insight challenging. The new pathway approach groups students in to easily-comprehended pathways within a qualification, enabling analysis on which paths are more or less successful, which has potential for improving the evidence base for advice to students on study paths and thereby - hopefully - student success.

Using these two approaches together should help generate better understanding of student study path behaviour. They take complementary approaches: the ArangoDB visualisation starts with students who studied the initial module in 2012 and follows their pathways afterwards; the pathway analysis uses students' later study to assign them to pathways and use those to explore how those students did when they did earlier modules in the qualification. As in the previous report, this section is largely exploratory, rather than definitive in its findings.

RQ 9. Which routes, specialisms and pathways in QUAL2F3 are “successful” for students following Bsc Natural Science?

## 2.2 Methods and approaches used

### 2.2.1. Open degree

We consider, in turn, each of the five identified generic study paths through CW1 taken by new students (students who had not previously studied any other OU module), and then report on the Access students pursuing each of the routes. In each case, we report on the students successfully passing all modules in the route. We then reflect on the broader cohort, including students that have not passed the final module in that specific route. The details of each generic study route are set out in [Appendix2](#).

### 2.2.2. QUAL2F3

The dataset spans OU study between 2012J (when the new funding regime started in England) to 2018B. The ArangoDB visualisation tool ([Edwards, 2017](#); [Ullmann et al., 2018](#)) was used to explore the subsequent study paths of all the new students who passed the 2012J presentation of M2F3 *Exploring science*, the first module in QUAL2F3 at that time. Only new students were considered, since they are just embarking on their OU study, and continuing students would have been highly likely to have started in the old, pre-loans regime. We recognise this report excludes Access students, and will extend the analysis to this group in the future.

In addition to the ArangoDB approach, the new pathway analysis seeks to probabilistically assign each student to a pathway, based on a count of the credit points they have achieved for modules linked closely to that pathway. Modules shared between pathways are counted proportionally. Each student is assigned to the pathway for which they have the highest count (i.e., ties are broken at random.) So, for example, a student who completed the 30-credit module M21F3 would score 30 credits towards the pathway Z. Full details of the mapping of modules for QUAL2F3 is given in the [Appendix2](#), as well as alternative approaches in [Table A 2.8](#)



There are several important things to note about this analysis. Firstly, it deals only with successful students: students who have not (yet) achieved a pass in at least one pathway module will not be included. Secondly, the pass rates (and other metrics) will not add up to the same as in other contexts and will tend to be better, because many students, particularly less successful ones, will fall out of this analysis.

The results presented here explore only results that students have linked to QUAL2F3. It would be possible to do the analysis on the whole dataset, which would pick up students who were following those pathways but linked to another qualification, or not linked at all. This would have the merit of being entirely based on behaviour, rather than stated study intention, but would further complicate comparison with other statistics. Also, this approach would count students within a pathway even if they had departed from it later. For example, it would include a student registered on the open degree whose path happened to be compatible with the pathway X and Y up to level 2, but then switched to non-science modules at level 3.

## **2.3 Findings**

### 2.3.1. Open Degree

By examining the actual study choices made by students we find 268 successful study paths through CW1. Table 2.1 shows the number of students, and distinct study paths taken on each of the five different CW1 study reported above. These include the paths starting with an Access module. The ‘main paths’ column presents results for those pathways through each route with over 100 students.

The actual study paths that have more than 100 successful students, i.e., those that pass Stage 1 first time, are in Table 2.2. These eight study paths account for 89% of the students that have successfully achieved CW Stage 1, irrespective of their stated qualification aim. The list includes one combination starting with an Access module (M1F0 ->M3F1 ->A 151). This combination is the third most popular way of completing CW1, and appears to be the best at enabling students to pass first time.

*Table 2.1 The number of students attempting and succeeding for each of the generic study routes*

study path template	Number of students attempting and succeeding (first time) the generic study route		Numbers of distinct study paths with at least one student succeeding at first attempt*	
	attempted	SAFA	>=1	>100
a) CW1 -> Level 1 30 credit -> Level 1 30 credit	1759	1114	130	2
b) Level 1 30 credit -> CW1 -> Level 1 30 credit	79	31	28	-
c) Level 1 30 credit -> Level 1 30 credit -> CW1	283	77	44	-
d) CW1 -> Level 1 60 credit	7564	4807	32	5
e) Level 1 60 credit -> CW1	881	371	34	1
Total	10566	6404	268	8

Note: With the number of different study paths where at least one student passed first time, and the number of main paths with over 100 students succeeding at first attempt (SAFA). \* and with >100 students within generic study route

*Table 2.2. The successful study paths to completing CW1 Stage 1 with at least 100 students completing the stage.*

Stage 1 Study path with >100 students passing	Number passing	SAFA: Pass/all outcomes (%)
M1F1 -> M2F1	3813	73
M1F1 -> M3F1 -> M4F1	638	75
<b>M1F0 -&gt; M1F1 -&gt; M2F1</b>	<b>321</b>	<b>77</b>
M1F1 -> M5F1	271	69
M1F1 -> M4F1 -> M3F1	219	72
M1F1 -> M6F1	191	68
M1F1 -> M7F1	148	70
M1F3 -> M1F1	110	67
Total	5711	571

Note: With success at first attempt (SAFA) for the final module. In descending order.

### 2.3.2. QUAL2F3

Our aim was to produce a graphical summary of the ongoing study of new students who passed M2F3 2012J. This was generated using ArangoDB. There were 2291 students studying the 2012J presentation of M2F3. Of these, 969 (42%) were female and 1322 (58%) were male. [Table A2.9 in Appendix2](#) summaries the study outcomes by new and continuing students. All figures are at R25 and therefore ignore early withdrawals. It shows that for this presentation there was a 54% efficiency in enabling students to pass first time: 51% for new and 56% for continuing students.

When we traced all the ensuing study for the new students passing M2F3 2012J, the resulting visualisation was too complex for any patterns to be discernible. For example, there are 52 paths from M2F3, then 40 paths that lead from the most popular two of these to the next set of modules. It was necessary to filter the results, in order to focus on the most significant paths. Whilst this approach does clearly lead to a visualisation of the main study paths, it must be noted that many students do not follow these.

*Table 2.3. Summary of modules selected and criteria used at each iteration*

iteration	student modules in scope	students selected	modules in scope	modules selected	criteria
1	693	343	52	2	clearly most significant by numbers
2	259	171	40	9	with $\geq 10$ students attempting
3	149	75	36	5	with $\geq 10$ students attempting
4	68	17	23	2	Level 3 Modules - as closest to degree completion
5	8	5	4	2	modules where students passed
6	1	1	1	1	only module

Note: The column 'Student modules in scope' may count individual students more than once: if they go on to study more than one module concurrently.

Therefore, we checked which modules the new students who passed this presentation of M2F3 went on to study next, made a judgement over which students to follow and then moved on to the next step in their study. At each iteration we took the same steps: evaluating the modules those passing the current module go on to study next, determining which to follow,

then following them. In all, we carried out six iterations of this process. A brief summary of findings at each iteration is given in [Appendix2](#).

The results are summarised in Tables 2.3 and 2.4. In Table 2.3, we see the numbers of students decreasing at each iteration. This is in part due to the decrease we are used to seeing in numbers of students continuing their studies but also here due to the criteria we have used at each iteration to keep our focus on the main study routes. Table 2.4 is a summary of the efficiency of the final module in enabling students to pass first time - within the context of the study path. The full set of values for all the modules is in [Table A2.10 in Appendix2](#). The values in Table 2.4 appear to show that the efficiency of the final module in enabling students to pass first time decreases with the length of the study path - the number of modules studied. Given that all the students at each iteration of this analysis have passed all the previous modules first time in their study path, this might be interpreted as the curriculum becoming relatively harder, the further into a degree programme a student reaches.

*Table 2.4 Summarises the number of modules and the number of students included at each iteration.*

Iteration	number of modules	Total number of students	P/all (%)
1	2	343	65
2	9	171	81
3	5	75	69
4	2	17	53
5	2	5	40
6	1	1	100

Note: It also give the overall, mean efficiency of these final modules at enabling students to pass first time. The full list, including module values is in [Table A2.10 in Appendix2](#)

The graphical output is shown in Figure 2.1. This shows the study pathways followed by the students who met our study criteria at each iteration of the analysis. Although this is a static image, within the ArangoDB interface this is an interactive plot which offers greater potential than we have currently used here both to rearrange to improve legibility and ultimately to act as an interactive filter: with the ability to add or reduce information and detail as necessary.

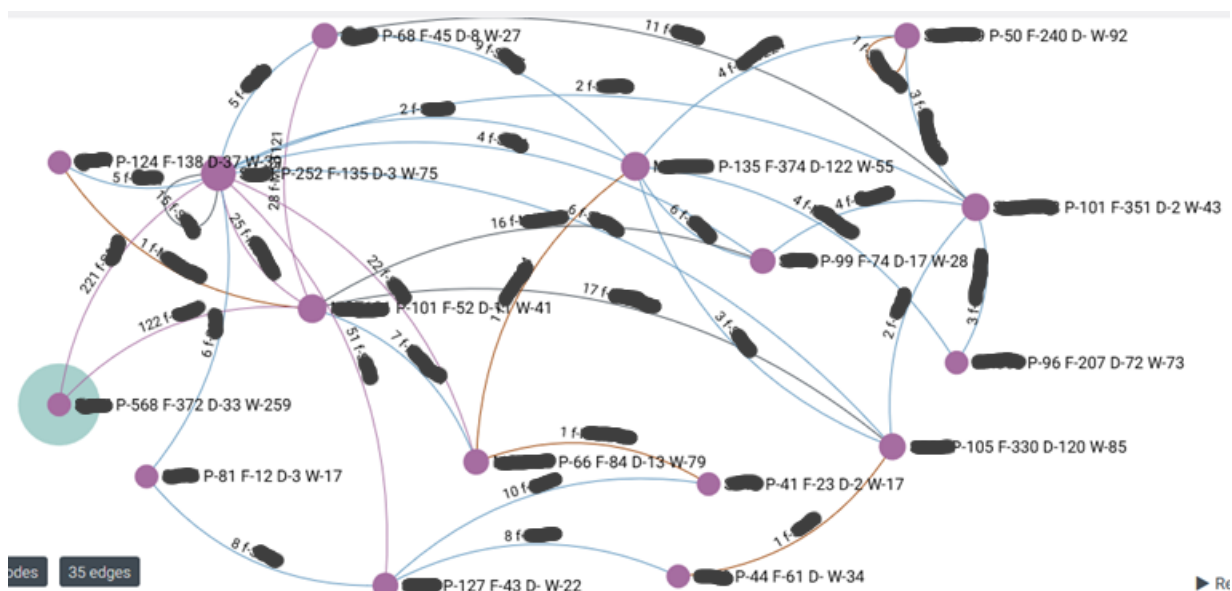


Figure 2.1 The ‘most significant’ study pathways taken by new students passing M2F3 2012J. Note that this figure has the module codes blanked in order to anonymise.

Each module (node) is shown as a pink circle, with the module code and the number of students who passed (P), failed (F), deferred (D) or withdrew (W) from the module. The paths taken by students (edges) are shown as curved lines, with the number of students following that path indicated with the module they came from. So, for instance, towards the bottom left-hand corner, there is a pink circle for M24F3, with a legend showing that 81 students passed, 12 failed, 3 deferred and 17 withdrew, and two lines emerging, the upper one showing that 6 students came from S141 and 8 students came from M9F3.

In terms of the second step of probabilistic pathway analysis, this dataset contains 24,998 records – that is, there are that many student module attempts linked to qualification QUAL2F3. There are 7,950 different students, studying 112 different modules. There are 52 different presentations. The main pattern is as expected: the J presentations are the most common, and on J presentations the number of student presentations increases over time as more students join the qualification. More details of the modules they studied and the presentations they were on are shown in [Appendix2](#).

The number of modules passed varies widely between students, and is quite different between students assigned to a pathway and others (full details are shown in the appendix). This makes it almost impossible to meaningfully compare outcome results between students assigned to a pathway and others. To be assigned to a pathway, the student has to have been successful for many modules already. Put another way, students who progress through the qualification are more and more likely to be assigned to a pathway. Thus, students assigned to a particular pathway will tend to be biased towards greater success, as was previously found ([Rienties, Clow, et al., 2017](#); [Rienties, Rogaten, et al., 2017](#)).

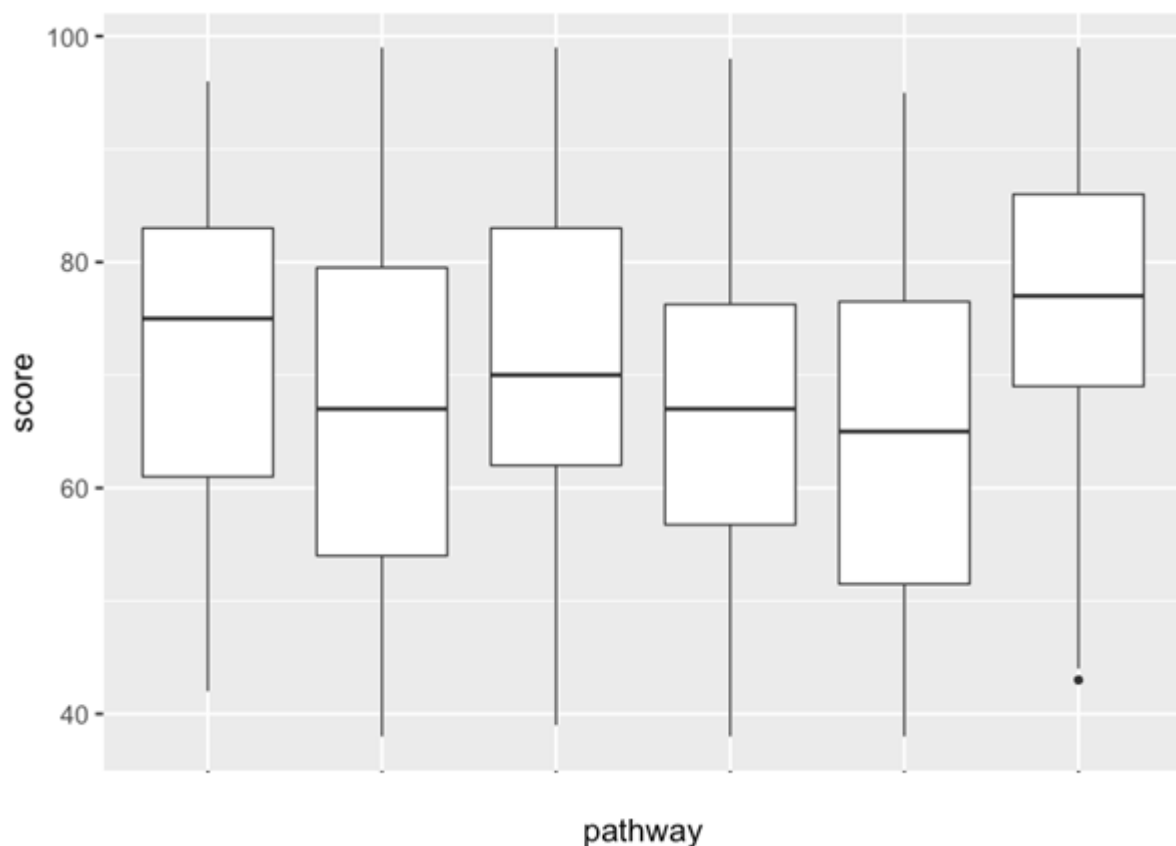
It is less problematic to compare outcome results between pathways, though. If the pathways had very different profiles – for instance, if one pathway had its distinctive modules only at level 3 – we might expect the same effect. However, for QUAL2F3 at least, the profiles are broadly comparable. There are clear differences between pathways in terms of modules

passed, but this is almost certainly just an artefact of how many 60-point modules there are in each pathway: some pathways have a greater number of smaller modules than others.

Having assigned students to a particular pathway, it is possible to analyse performance on different modules by pathway. Results for M2F3, the first module studied by most students on Q6, are shown here.

M2F3 is a 60-credit module and the first, introductory science module in QUAL2F3. Its first presentation was 2008B, and its last was 2016J. It was replaced by S111. The final score obtained by students is shown in the Figure 2.2 below, broken down by pathway. The mean scores for students on the (72.1, SD = 13.8) and the (75.9, SD = 13.0) pathways are higher than those for the other pathways. About half of the students are not assigned to any pathway ('other'), and their mean score is considerably lower (60.6, SD = 15.0) than for students who have been assigned to pathways. However, as discussed above, this comparison is misleading, since the more successful a student is, the more likely they are to be assigned to a pathway.

*Figure 2.2 Final score on M2F3 achieved by students on different pathways*



A factorial ANOVA was conducted to compare the main effect of pathway and a series of demographic variables (low educational qualifications (lowquals), gender, young age (<25) and black ethnicity), and all the permutations of interactions between those variables, on the student's final score. Highly significant main effects were found for all of these independent variables, with the exception of gender, as shown in Table 2.5 below. None of the interaction effects were significant. Coupled with the highly significant main effect of pathway, this strongly suggests that the difference in scores by pathway are significant in themselves and are not fully explained by the variation in demographic factors.

*Table 2.5 Results of factorial ANOVA comparing the effect of pathway and demographic variables, and all their interactions, on the score achieved by students on M2F3*

<b>M2F3</b>	<b>Df</b>	<b>Sum sq</b>	<b>Mean sq</b>	<b>F value</b>	<b>Pr(&gt;F)</b>	<b>Signif</b>
pathway	5	16556	3311.1	16.625	6.62E-16	***
lowquals	1	8886	8885.7	44.614	3.65E-11	***
Gender	1	47	46.6	0.234	.628	
Age	1	2823	2823.2	14.175	1.75E-04	***
Black	1	2074	2074.5	10.415	.00128	**

Note: all interaction effects were not significant and are omitted for brevity. (lowquals is coded 1 for students with less than two A levels, 0 otherwise; gender is coded 1 for female, 0 for male; young age is coded 1 for age 25 or under, 0 otherwise; black is coded 1 for black ethnicity, 0 otherwise)

Do students on different pathways succeed in their study at meaningfully different rates? With students assigned to individual pathways, it becomes possible to carry out further analysis of student success. The final question here would be whether studying different pathways affect student success overall on the qualification: that is, whether they are more likely to complete it, and what final degree classification they achieve. Unfortunately, the number of students in this dataset who have completed QUAL2F3 is too small to make meaningful comparisons between pathways. Various intermediate success points were explored, including completion of a capstone project module, but these also had insufficient numbers. The success point latest in students' study journey that had a large enough sample was completion of at least one module at level 3.

The proportions of students completing at least one module at level 3 are shown in Table 2.6. There are some minor differences between the pathways, but the striking figure is the low score for the pathway X, with only 24% reaching level 3, compared to over 40% on all the other pathways.

*Table 2.6 Students who studied at least one module at level 3, showing the number assigned to each pathway and the proportion*

<b>Reaching level 3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
Number	64	243	139	93	70	154
Proportion	24%	41%	44%	43%	46%	43%

A logistic regression was carried out conducted to compare the main effect of pathway and a series of demographic variables (low educational qualifications (lowquals), gender, young age (<25), and all two-way interactions, on whether the student completed at least one module at level 3. (Black ethnicity was not explored as numbers were too small.) As indicated in Table 2.7, significant main effects were observed for pathway, but not for the demographic

variables. Students studying all pathways other than the pathway were significantly more likely to have reached level 3 (odds ratios for all others are more than 2.2). The low success rate for students on the pathway successfully completing at least one module at level 3 is very striking, and warrants further investigation. It may be some artefact of that pathway, or it may reflect a real and important problem that should be addressed (which might well be something already known to the Qualification Team, such as a module with a particularly low pass rate.)

*Table 2.7 Results of logistic regression of comparing the effect of pathway and demographic variables, and their two-way interactions, on whether students completed at least one module at level 3*

	Odds ratio	95% confidence interval	p	
Pathway1	1.000	-	-	-
Pathway2	2.295	1.409–3.775	.000938	***
Pathway3	2.594	1.554–4.370	.000295	***
Pathway4	2.892	1.628–5.176	.000311	***
Pathway5	2.793	1.445–5.419	.002257	**
Pathway6	2.485	1.566–3.996	.000136	***
Lowquals	0.661	0.299–1.364	.281	
Gender	1.350	0.709–2.519	.352	
Age	0.865	0.345–1.971	.742	

Note: Showing odds ratios compared to the base case of the astro pathway. All interaction effects were not significant and are omitted for brevity. (lowquals is coded 1 for students with less than two A levels, 0 otherwise; gender is coded 1 for female, 0 for male; young age is coded 1 for age 25 or under, 0 otherwise; black is coded 1 for black ethnicity, 0 otherwise)

## 2.4 Conclusions

For the Open Programme Level 1 ‘Creative Writing’ programme of study, 268 different paths are taken by students. The most popular Stage 1 study combination is M1F1 -> M2F1. This is effective, with 73% of those attempting the second module, passing first time. The most effective study path at enabling 77% of students who attempt the final module to pass first time has an Access module entry, M1F0 -> M1F1 -> M2F1. The group of students taking an Access module before starting on Level 1 modules appears to have an increased chance of success than the remainder, that do not. The least effective combination of modules for enabling students to pass their final module is M1F3 -> M1F1 with an efficiency of 67%. This means that for the most popular study routes (with over 100 students) there is a significant difference of 10% in terms of enabling students to pass their final module at first attempt.

We have introduced the term ‘efficiency’ to extend our understanding of how students pass. By considering efficiency as the percentage of those who pass of all study outcomes, including deferral, fail and withdrawal, we see how well a study path enables students to



succeed by passing first time. This gives another insight into the study experience. Using a graph database has enabled us to readily run queries that traverse data, selecting students that have studied generic study routes and identify popular and successful combinations of modules that enable students to complete their study. The approach is able to cope with the complexity of OU study choices.

This approach offers insights into the actual pathways our students take and their chances of success. This work will now be expanded to further study routes within the Open programme, and to further qualifications. Avenues for future work include the potential to inform qualification design, and to present students with guidance that helps them to make informed choices about their path to a qualification.

## **2.5 Contacts**

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## 3 IMPACT OF STUDY BREAKS ON INTERTEMPORAL ENGAGEMENT AND PASS RATE

### Highlights

1. Big data analysis of 123,916 students and 205 OU modules indicate that the way OU designs study weeks has a substantial impact in how students study over time.
2. Study break weeks (i.e., no planned learning activities) substantially increase the chances of students to pass a module.
3. Despite active engagement by students, TMA and EMA revision weeks are not related to pass rates
4. Substantial variation of practice is identified how students are expected to spend their time within modules, whereby more study breaks could help to increase pass rates

### 3.1 Introduction

*Study breaks* are weeks during which no learning activities are planned or take place, and students are not expected to study for a module. This also includes public holidays, such as Christmas or Easter. Study breaks may be opportunities for some students to catch up with their studies, while for others it may provide opportunities to take a break from studying. So-called *preparation weeks* before the submission of an assignment are weeks with no learning activities, yet students are expected to prepare for an upcoming assessment, which we label as Tutor Marked Assignments (TMA) preparation weeks and End of Module (EMA) preparation weeks. Previous published research by [Nguyen, Thorne, et al. \(2018\)](#) has already showed a positive association between study breaks and the odds of passing a module, or module pass rates, at the OU, while there was no statistically significant effect in relation to the number of assessment preparation and revision weeks.

In this chapter, we build on this research by [Nguyen, Thorne, et al. \(2018\)](#) and examined the impact of study breaks and TMA/EMA preparation weeks on Virtual Learning Environment (VLE) engagement as well as academic performance. We first will explore data from 205 modules using a “big data” but aggregate perspective. Second, we will dig deeper into VLE engagement of one exemplar module to illustrate how students strategically work and plan their studies. Finally, we will review some common and uncommon learning designs across the four Faculties to illustrate the diverse practice of study breaks and preparation weeks. We aim to address the following three research questions:

RQ.10 How do study break weeks and preparation weeks influence the odds of a student passing a module?

RQ.11 How do students engage in the VLE during EMA preparation weeks (exam revision weeks)?

RQ.12 What are typical and atypical examples of modules with either low or high preparation and study breaks weeks, and how “successful” are these modules?

### 3.2. Methods and approaches used

To answer RQ10, we ran a (mixed-effects) logistic regression to identify whether the odds of a student passing or failing a module relate to their demographic characteristics and/or the design of the module. In this study, 205 modules with an average length of 29 weeks were entered in the analysis. The shortest module lasted 21 weeks and the longest one lasted 35 weeks. 79 modules were on Level 1, 67 modules were on Level 2 and 59 modules were on Level 3. 67% of the modules were 60 credits, and 33% were 30 credits. These modules were from Social Sciences (45%), FACULTY 3 (11%), Business (25%), Department Y (10%), Arts (8%), and Languages (3%)

In order to address RQ11, we specifically selected one specific Introduction to Business module, whereby 3385 students participated. In the three presentations of the Introduction to Business module, we examined fine-grained engagement in the VLE during TMA and EMA preparation weeks to unpack what, when and how students were doing. Building on research methods developed by [Nguyen, Thorne, et al. \(2018\)](#), a (mixed-effects) logistic regression was performed to identify the odds of a student being engaged with VLE during the EMA preparation weeks and whether this was related to: (a) four types of learning activities: study materials, exam materials, forums that is online tutorial, student online café, forums, and other resources including library and additional resources; (b) the number of days before the exam submission deadline, and (c) study break weeks. In this analysis, we examined the log data (i.e., VLE trace data) of 3385 students who completed the module *Introduction to Business*, across three different presentations (2015J, 2016B, 2016J). This was a 60 credit module that lasted for 32 weeks. It had 5 TMAs counting for 50% of the final mark and a final assessment counting also 50%. It also had 3 study break weeks, two weeks during Christmas and one during the Easter holidays as well as 2-4 preparation weeks before the final assessment. Both TMAs and the final assessment required the production of a written report/essay of varied length. A student passes the module when they achieve 40% average score in TMAs and 40% in the final assessment. A 65% of the students completed the module and 60% manage to also pass it. Log data were aggregated based on the learning activities students were engaged with over the course presentation, in four categories: (a) study materials, (b) exam materials, (c) forums that is online tutorial, student online café, forums, and (d) other resources including library and additional resources.

Finally in order to answer RQ12, we used [Yin \(2009\)](#)'s case-study approach to present five examples of modules across the four Faculties which can be considered as 'outliers' or extreme cases (i.e., having either extremely low or extremely high number of study breaks, TMA catch-up week, and EMA prep weeks). [Yin \(2009\)](#) emphasised that a case study investigates a phenomenon in-depth and in its natural context. Therefore, the purpose of a case study is to get in-depth information of what is happening, why it is happening and what the effects are of what is happening. By using this extreme sampling technique, we aim to explore the rich, diverse learning design and assessment practices at the OU, without making a normative judgement of which learning design is best or worst.

### 3.3. Findings

First of all, we explored the descriptive statistics of how the 205 modules balanced the study break weeks with TMA and EMA pre-weeks. As indicated in Table 3.1, on average the 205 modules had 2.58 study break weeks “pencilled in”, where students were not expected to study or prepare for an assignment. As highlighted by the standard deviation, typically modules would have between 2-4 study breaks, while there were modules with only one study break, and some with as much as seven weeks. Similarly, on average 4.16 TMA preparation weeks were designed, but with a much higher standard deviation. As highlighted by the Min and Max of Table 3.1, there were several modules that had no TMA preparation weeks, while for some modules there were as much as 12 weeks to TMA preparation weeks. Finally, many modules had on average three weeks of EMA preparation weeks, but as before with TMA preparation weeks there was substantial variation in terms of how these were allocated.

*Table 3.1 Study weeks, study breaks, and TMA/EMA preparation weeks*

	N	Mean	St. Dev.	Min	Max
Study week	205	29.02	3.75	21	35
Study break week	205	2.58	0.81	1	7
TMA prep week	197	4.16	2.66	0.00	12.00
EMA prep week	193	2.93	1.49	0.00	12.00
TMA prep as %	197	0.14	0.09	0.00	0.39
EMA prep as %	193	0.10	0.05	0.00	0.39
# of students enrolled	205	726.61	718.33	36	5,066

#### **RQ1 How do study break weeks and TMA/EMA preparation weeks influence the odds of a student passing a module?**

As indicated in Table 3.2, in terms of the design of the module, the following design characteristics were found to influence the odds of passing a module:

- Students had 42% higher odds of passing a 30 credit module compared to a 60 credit module ( $p < 0.001$ ).
- Students had 22% lower odds of passing a module with a final exam compared to a final report ( $p < 0.001$ ).
- Students had higher odds of passing level 2 and level 3 modules compared to level 1 modules ( $p < 0.001$ ).
- The greater the number of break weeks in a module the higher the odds (by 28%) of passing a module ( $p < 0.001$ ). For example, students in a module with two break weeks as opposed to a module with 1 break week had 28% higher odds of passing their module.
- The number of TMA and EMA preparation weeks was not related to the odds of passing the modules.
- Semesters did not have any effect on the odds of passing.

*Table 3.2 A mixed effect logistic regression of how exam preparation weeks influence the odds of passing a module.*

DV: Pass/Fail	Odds Ratio	CI	P
(Intercept)	2.3	1.52 – 3.49	<.001
Fixed effect			
Credits 30 (ref=60)	1.42	1.23 – 1.64	<.001
Enrolment	1.00	1.00 – 1.00	0.033
Semester (ref=J)			
Semester B	1.03	0.87 – 1.21	0.742
Semester D	1.02	0.77 – 1.36	0.888
Final Exam (ref=final report)	0.78	0.69 – 0.89	<.001
Course level (ref = 1)			
Level 2	1.47	1.28 – 1.69	<.001
Level 3	2.24	1.91 – 2.62	<.001
Break week	1.28	1.14 – 1.43	<.001
EMA prep week as %	0.22	0.07 – 0.76	0.016
TMA prep week as %	1.13	0.49 – 2.61	0.771
Random effect of modules			0.52 (0.72)
Number of modules		187	
Number of students		111,610	

Note: Random effect was reported as variance and standard deviation in the parentheses. For a detailed analysis in terms in ethnicity, prior education, gender, and age, we refer to [Nguyen, Thorne, et al. \(2018\)](#).

There is substantial evidence that shorter modules are relatively easier to complete in comparison to longer modules ([Rienties & Toetenel, 2016](#); [van Ameijde, Weller, & Cross, 2018](#)). The lower pass rates for exams relative to written essays might be explained by the increased anxiety and stress of participating in final exams, and the “one-shot” nature of exams, whereby the performance of the day might influence students’ cognition. In contrast, with final

reports students may have more time to reflect on their learning processes and written outcomes ([Carless, Salter, Yang, & Lam, 2011](#); [Richardson, 2015](#)). It is widely documented in our previous Scholarly Insight reports that once students have successfully completed their first modules, they are more likely to complete level 2 and level 3 modules ([Rienties, Clow, et al., 2017](#); [Rienties, Rogaten, et al., 2017](#)). The primary purpose of this study was to look at the impact of study breaks, whereby we indeed found support that having study breaks significantly improved the odds of students passing a module.

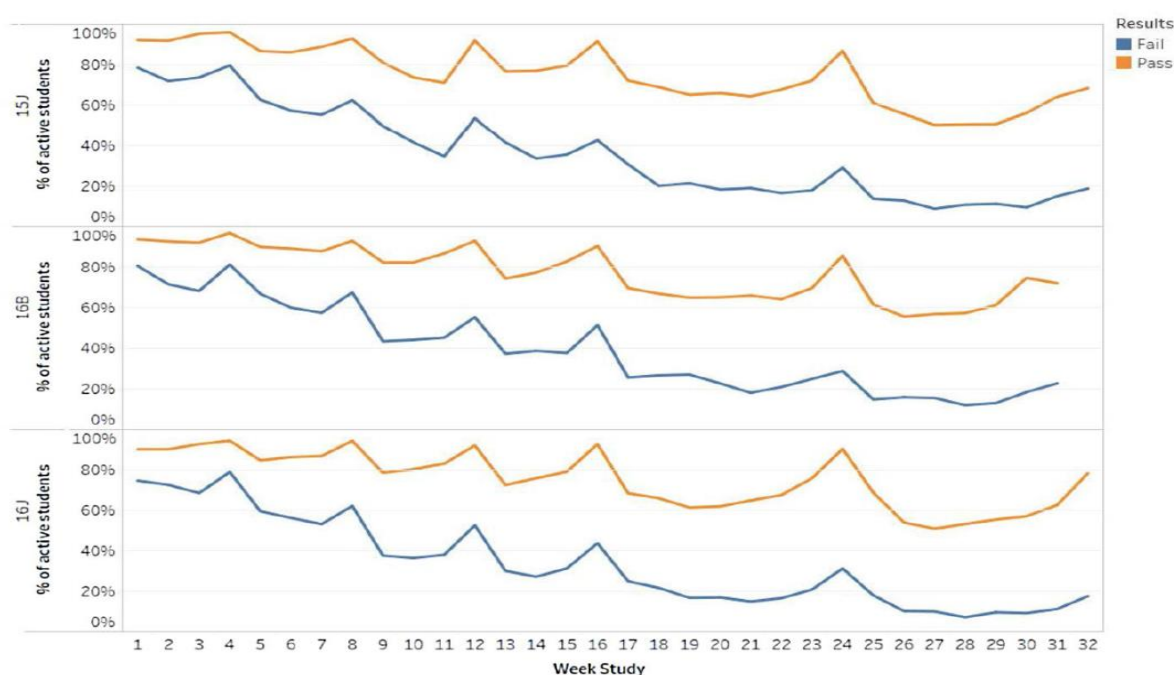
One possible reason why TMA and EMA preparation weeks had no impact on pass rates across our large data set might be related to how students plan their learning activities over time, and how this is influenced by their life circumstances. As most students who make it through till the end pass the module, perhaps the additional EMA preparation week might have limited impact on these students. As highlighted by recent research ([Nguyen, Huptych, & Rienties, 2018a, 2018b](#)), most students do not follow the course schedule, and “failing” students are mostly failing because they fall too far behind. Having a study break to take a breather seems to have a positive impact on these students, as well as students who are more or less on track but can use these study breaks to do other things.

## **RQ2 How do students engage in the VLE during EMA preparation weeks (exam revision weeks)?**

In order to unpack this rather surprising finding that EMA preparation weeks did not have a significant positive effect on pass rates, we dug a bit deeper into one specific *Introduction to Business* module, whereby 3385 students participated. In the three presentations of the *Introduction to Business* module we examined, we found that students who passed their modules (orange line) were more active in the VLE than students who failed (blue line) (See Fig 3.1). In Figure 3.1, there are six peaks in VLE activity that corresponded to the weeks before the TMA submissions and the week before the EMA submission, suggesting that students were particularly active during the TMA and EMA preparation weeks. In addition, only a small number of students who failed were active in VLE, and their number decreased over time. The nearest the TMA deadline, the more students were active in both groups (fail and pass) whereas the number of students decreased drastically during the last two weeks of the module.

A closer look at the behavioural engagement patterns of 3385 students in the VLE suggested that the proportion of active students in the pass group was higher than the fail group. The proportion of active students in the fail group drastically decreased over time compared to the proportion of active students in the pass group. The percentage of active students in the pass group was 60%-80% and 10%-20% in the fail group. In other words, most of the students in the fail group already stopped engaging on VLE toward the end of the course, and there was only a small proportion was active during exam preparation weeks.

Figure 3.1 VLE engagement of passing and failing students across three different presentations



A follow-up regression analysis identified the factors that influence students' engagement with VLE during the EMA preparation weeks. Results shown that the nearest the deadline of an assignment, the more students were active in VLE (5% higher odds of being more active nearer the deadline,  $p < 0.001$ ). Students who passed had 64% higher odds of being active during the exam weeks compared to students who failed. Also, as expected, students were more likely to be engaged (by 12%) with the EMA material than forums, TMA material, study materials and other materials. Again, as highlighted in RQ1, our findings indicate that the OU will need to be more flexible in their design of helping students who become inactive in the early phases of their learning.

### RQ3 Case studies of modules with study break weeks

In this final section, we will present five examples of modules across the four Faculties which can be considered as 'outliers' (i.e., having either extremely low or extremely high number of study breaks, TMA catch up week, and EMA prep weeks). By using this extreme sampling technique, we aim to explore the rich, diverse learning design and assessment practices at the OU, without making a normative judgement of which learning design is best or worst.

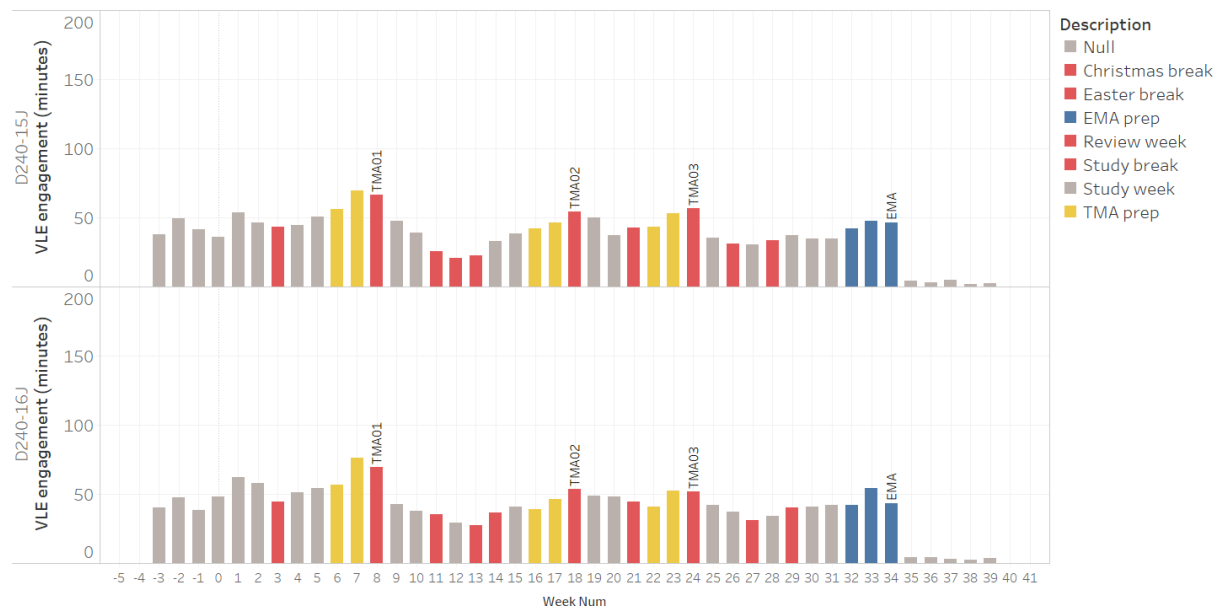
#### Module 1: High number of study break weeks, performance, and VLE engagement

MODULE 1 is a level 2, 30 credits module in FACULTY 1. In this report, we analysed the module in presentation 15J and 16J. The module consisted of 31 study weeks, 20% of which were study breaks (e.g., 2 weeks during Christmas, 1 week in Easter, and breaks in week 8, 16, and 22), although as highlighted in Figure 3.2 three of these study breaks were actually TMA preparation weeks. There were 3 TMAs in week 7, 15, and 21, and an EMA in week 31. There were approximately 1,300 enrolled students (calculated at 25% FLP). This module had a relatively good pass rate (71%, 70%) and completion rate (74%, 72%) in 15J and 16J presentation respectively. As highlighted by Figure 3.2, even when there was a study break



many students still actively engaged with the VLE, indicating that many students were catching up, or preparing for the next learning activities. In terms of VLE use, students spent more time in VLE nearer the TMA and EMA submission deadlines. More activity was observed, in particular, before the submission of TMA01.

*Figure 3.2 VLE engagement per week and design of assessment and study breaks in MODULE 1*

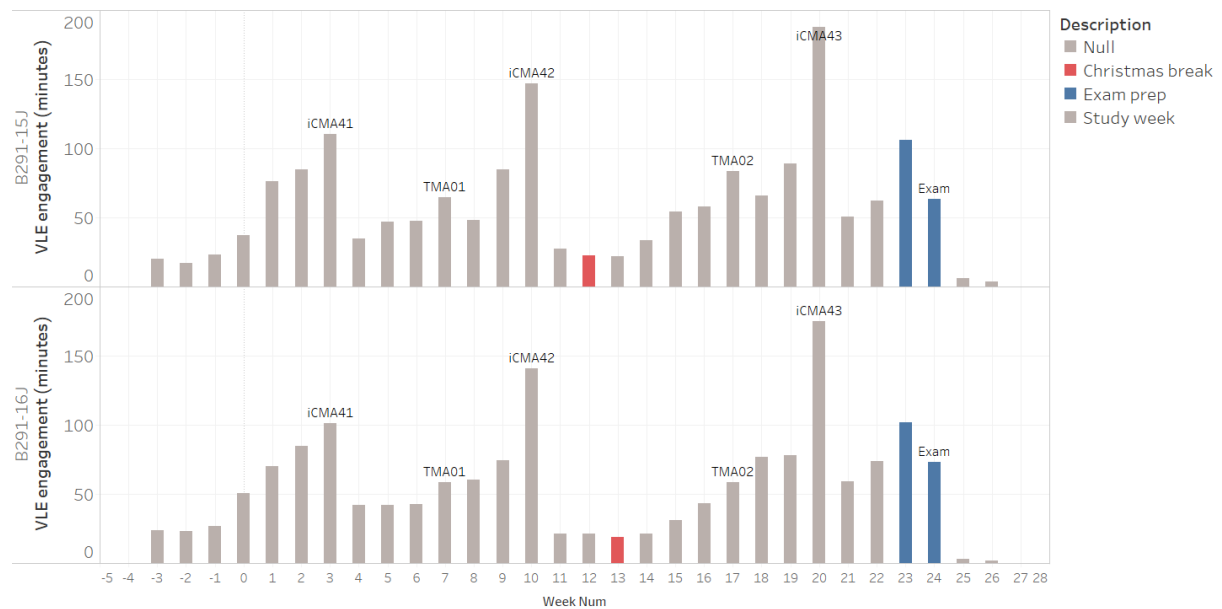


## Module 2: Low number of study break weeks, performance, and VLE engagement (MODULE 2)

MODULE 2 is a level 2, 30 credits module in FACULTY 2. The module consisted of 21-25 study weeks, 4-5% of which were study breaks (only 1 instead of 2 weeks during Christmas). There were 3 iCMAs in week 3, 10, 19, and 2 TMAs in week 3 and 17, and an examination at the end of the module. There were approximately 400 enrolled students (calculated at 25% FLP). This module had a pass rate around 31% - 35% and a completion rate from 44% - 48%. Although this module had a lower pass rate than others, it should be noted that the final assessment method was an examination, which had been established as more “difficult” than an EMA or a single assessment component approach. In terms of VLE engagement, there was a peak in activity the iCMAs weeks, whereby there was greatest engagement before iCMA3.



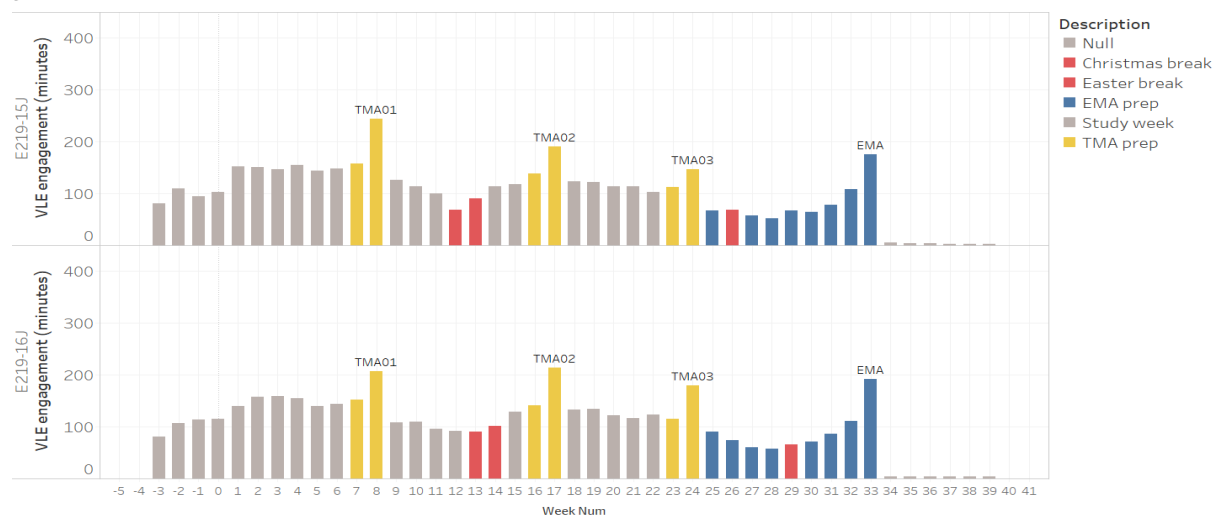
*Figure 3.3 VLE engagement per week and design of assessment and study breaks in MODULE 2*



### Module 3: High EMA preparation weeks, performance, and VLE engagement (MODULE 3)

MODULE 3 is a level 2, 60 credits module in FACULTY 4. The module consisted of 31 study weeks, 13-27% of which were EMA preparation weeks depending on presentations (e.g., 4,8,4 EMA prep weeks in 15J,16J,17J respectively). The EMA took the forms of a 3000 word essay, referred to as a mini-dissertation, drawing from the materials that students learnt throughout the module. There were 1,883 and 1,346 enrolled students (calculated at 25% FLP) in 15J and 16J respectively. This module had a pass rate around 69% - 74% and a completion rate from 72% - 77%. As in previous modules, there is a clear peak in VLE activity during the TMA and EMA submission weeks.

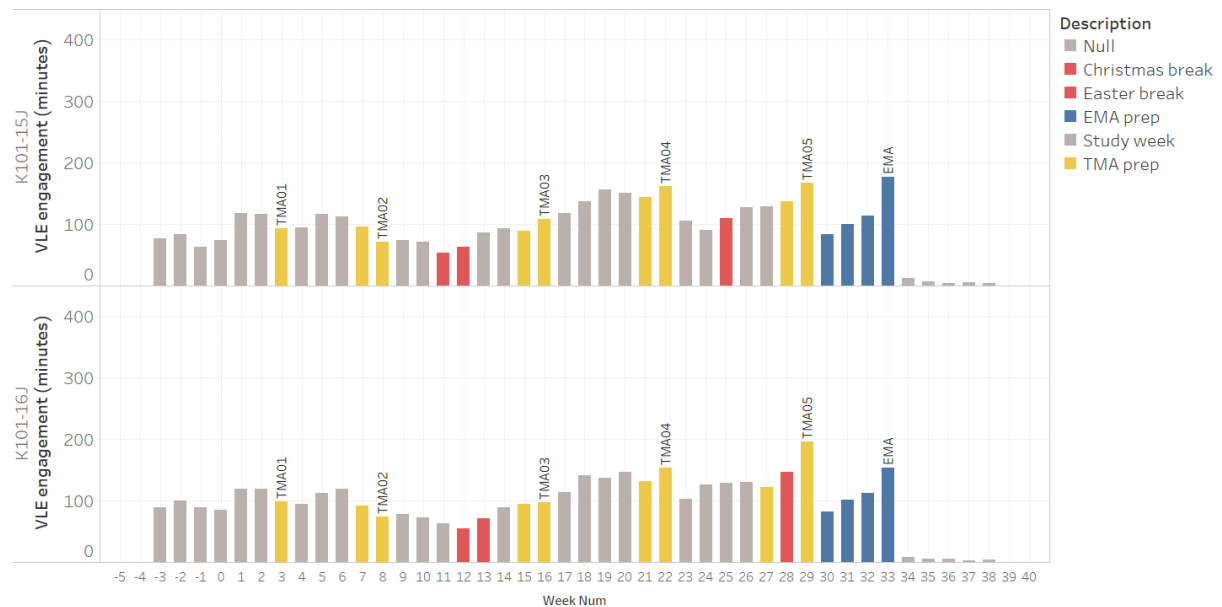
*Figure 3.4 VLE engagement per week and design of assessment and study breaks in MODULE 3*



## Module 4a: High TMA preparation weeks, performance, and VLE engagement (MODULE 4)

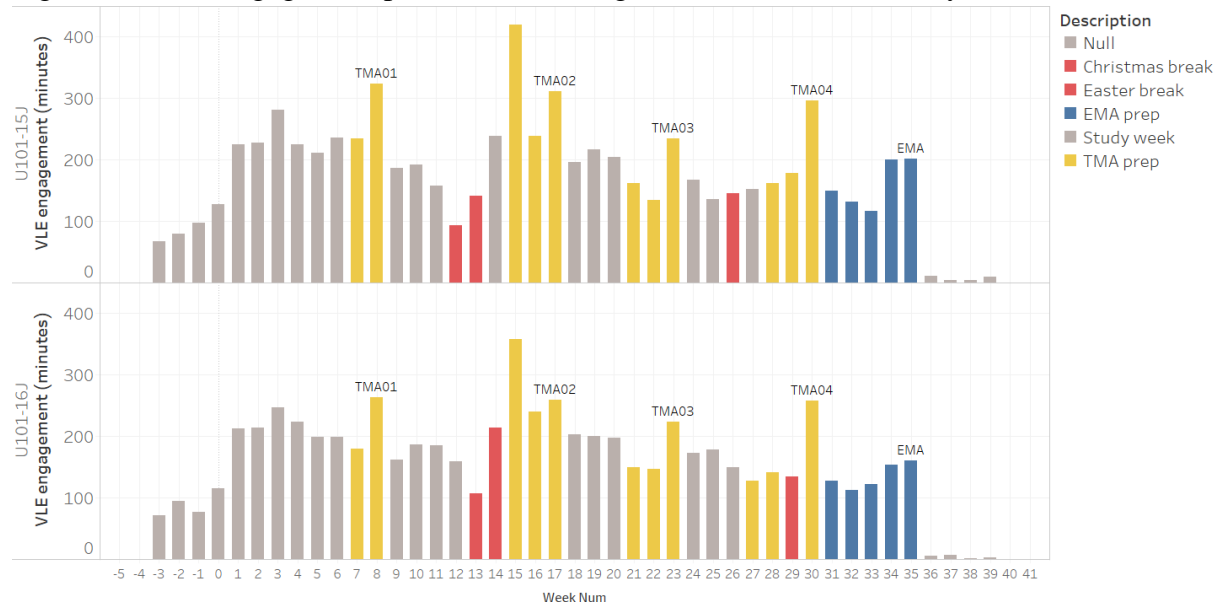
MODULE 4 is a level 1, 60 credits module in FACULTY 4. The module consisted of 30 study weeks. There were 5 TMAs and 9 TMA catch up weeks. There were 1,758 and 1,910 enrolled students (calculated at 25% FLP) in 15J and 16J respectively. This module had a pass rate around 70% and a completion rate from 73%. There is a relatively high VLE engagement throughout the module presentation and during weeks an assessment was not due. There was a peak of engagement the weeks TMA04, TMA05, and EMA were due.

Figure 3.5 VLE engagement per week and design of assessment and study breaks in MODULE 4



## Module 4b: High TMA preparation weeks, performance, and VLE engagement (M1F3)

Figure 3.6 VLE engagement per week and design of assessment and study breaks in M1F3



M1F3 is a level 1, 60 credits module in FACULTY 1. There were 4 TMAs and 11 TMAs catch up weeks in this module. There were 490 and 577 enrolled students (calculated at 25% FLP) in 15J and 16J respectively. This module had a pass rate around 57-58% and a completion rate from 59%-60%. While there was a peak of activity in VLE during the TMA submission weeks, the biggest peak is observed in week 15 (two weeks before the TMA02 submission).

### 3.4 Conclusions

In line with our previous findings ([Nguyen, Thorne, et al., 2018](#)), this chapter showed that the inclusion of study break weeks in the design of OU modules seemed beneficial for students' learning and performance, as study breaks can increase students' chances of passing a module. Study break weeks in the modules across the 205 modules included in this study ranged between 1 and 7. In contrast, TMA preparation and EMA preparation weeks did not significantly seem to influence pass rates, even though this is a wide-spread and deliberate practice across the OU. Other learning design characteristics influencing pass rates were 30 credit modules, final report (instead of examination), and Level 2 and Level 3 modules. Student demographic characteristics including ethnicity, age and gender were also found to explain the odds of passing a module (see Nguyen et al. 2018 for the full details).

What specifically became clear from RQ 11 and 12 was the way the OU designs its modules had a fundamental impact on student engagement, and subsequent passing or failing a module. As highlighted elsewhere ([Carless et al., 2011](#); [Nguyen, Rienties, Toetenel, Ferguson, & Whitelock, 2017](#); [Richardson, 2015](#); [Winne, 2017](#)), assessment drives engagement of students. In all modules analyses and the subsequent fine-grained analyses across six modules in RQ11-12 the timing of assessments primarily predicted peaks in VLE engagement. Therefore, one would expect that TMA and EMA preparation weeks would have a fundamental impact on pass rates, which again is surprising that we did not find any effect.

One possible reason could be related to the intertemporal decisions that students make to continue with a module or not. For example, the behavioural engagement patterns of 3385 students in the Introductory Business Module indicated that the proportion of active students in the pass group was higher than the fail group. Most noticeably, many of the failing students engaged less over time, but in the first seven weeks were relatively engaged. Perhaps one of the reasons why study breaks had an impact on pass rates was that these breaks allowed students, who were about to drop out, to take a breather and catch-up on missed work. However, once these students are too far behind the course schedule, offering them additional TMA or EMA preparation weeks seemed to have no impact on their intentions to continue. Similarly, for "successful" passing students having more or less TMA or EMA preparation weeks seemed to have no impact on their decisions to continue.

This could be explained by the survivor effect ([Arrighi & Hertz-Picciotto, 1994](#)), whereby students who were successful on previous TMAs are more likely to continue, in particular when the finish line is in sight. Taking a sporting metaphor, most runners who participate in a marathon who make it up to 35 km point will probably continue till the finish line, as this final line is nearly within reach. Therefore, offering more or less breaks (e.g., food and drink stalls) in the last 5 - 7 km (i.e., EMA preparation weeks) will not make a difference for these learners. Furthermore, these extra support structures will not have an impact on those

runners who are already struggling after say 7 km. Beyond a lack of training, there could be good reasons why these learners could actually make it to finish line if sufficient flexibility is provided, such as registering relatively late for the marathon, getting lost on the start line, or waiting for a running partner who eventually drops out with a sporting injury.

Of course focussing only on pass-rates ignores other essential learning outcomes, such as grades achieved, learning gains ([Rienties, Clow, et al., 2017](#); [Rienties, Rogaten, et al., 2017](#)), learning satisfaction (as discussed in [Chapter 1](#)), passive/active withdrawal, and long-term success within a qualification (as highlighted in [Chapter 2](#)). Furthermore, another obvious limitation of our research is the nested nature of data. Ideally, using evidence-based research principles we would be able to compare different design implementations of study breaks and preparation weeks within an experimental design of a range of modules to determine the actual impact of these timing decisions, and what the optimum amount of preparation and study breaks could be for which groups of students. In future research we will need to establish whether differences in study breaks and preparation weeks have a short- or long-term impact on OU study success.

Nonetheless, given both the big data finding and fine-grained but diverse learning design analysis our findings do indicate that the OU will need to be more flexible in their design of helping students who become inactive in the early phases of their learning. Many of these “inactive” students could be saved with more personalised support, as well as with learning designs that allow for a breather in terms of a study break. Both “successful” and other students seem to benefit from these study breaks, and in many other educational institutions across the globe it is common to have a break every 7-8 weeks.

We plan to extend this line of work to identify what the “optimum” number of study break weeks is. Furthermore, we plan to dig deeper into understanding why these study breaks are beneficial by, for example, interviewing or surveying students. TMA/EMA preparation weeks were not related to passing rates. Yet, it may be worth it to examine whether preparation weeks contribute to retention and completion rates, as they maybe an opportunity for students to complete and submit their assignments.

### **3.5 Contacts**

Main authors and contacts for this study: Quan Nguyen, Sam Thorne, Christothea Herodotou, and [Bart Rienties](#)

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